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WHAT IS CLAIMED IS:

1. A method of screening agents for use in the prevention or treatment of cancer comprising:
  - (a) contacting a vegetative cell of *Dictyostelium discoideum* with a test agent;
  - (b) assessing the cytotoxicity of said test agent;
  - (c) assessing the effect of said test agent on the expression of one or more of *repB*, *repD* and *APE* gene products; and
  - (d) comparing said cytotoxicity and said expression in the presence of said test agent with a vegetative cell of *Dictyostelium discoideum* not exposed to said test agent;

wherein

  - (i) a test agent that is cytotoxic but does not induce expression of one or more of *repB*, *repD* and *APE* gene products will be useful as a chemotherapeutic;
  - (ii) a test agent that is not cytotoxic but does induce expression of one or more of *repB*, *repD* and *APE* gene products will be useful as a chemopreventative; and
  - (iii) a test agent that inhibits the expression of one or more of *repB*, *repD* and *APE* gene products will be useful as a chemotherapeutic when applied in combination with a DNA damaging agent.
2. The method of claim 1, wherein assessing expression of *repB* is performed, and assessing expression of *repD* and *APE* is not performed.
3. The method of claim 1, wherein assessing expression of *repD* is performed, and assessing expression of *repB* and *APE* is not performed.

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4. The method of claim 1, wherein assessing expression of *APE* is performed, and assessing expression of *repB* and *repD* is not performed.
5. The method of claim 1, wherein assessing expression of *repB* and *repD* is performed, and assessing expression of *APE* is not performed.
- 5 6. The method of claim 1, wherein assessing expression of *repB* and *APE* is performed, and assessing expression of *repD* is not performed.
7. The method of claim 1, wherein assessing expression of *repD* and *APE* is performed, and assessing expression of *repB* is not performed.
8. The method of claim 1, wherein assessing expression of *repB*, *repD* and *APE* is performed.
- 10 9. The method of claim 1, further comprising measuring, in a vegetative cell of *Dictyostelium discoideum* not treated with said test agent, the expression of the same gene or genes as measured in step (c).
- 10 10. The method of claim 1, wherein cytotoxicity is assessed by measuring clonal plating, trypan blue exclusion, phyloxine B dye exclusion, and degradation/laddering of DNA.
11. The method of claim 1, wherein expression is assessed by hybridization of a probe to a target nucleic acid.
12. The method of claim 11, further comprising RT-PCR<sup>TM</sup>.
- 20 13. The method of claim 12, wherein said probe is a member of a primer pair for RT-PCR<sup>TM</sup> and comprises a label.
14. The method of claim 13, wherein the label is a radiolabel, a fluorophore label, a chemilluminiscent label, an enzyme label or a ligand.
- 25 15. The method of claim 14, wherein the <sup>label</sup> ligand is biotin, and the ligand is detected by contacting with enzyme-conjugated avidin and a detectable enzyme substrate.

16. The method of claim 11, further comprising binding target nucleic acid to a substrate.
17. The method of claim 16, wherein said substrate is a nylon or nitrocellulose membrane.
- 5 18. The method of claim 16, wherein said probe is labeled with a radiolabel, a fluorophore label, a chemilluminiscent label, an enzyme label or a ligand.
19. The method of claim 1, wherein expression is assessed by means of an expression cassette stably transformed into said a vegetative cell of *Dictyostelium discoideum*, said expression cassette comprising a nucleic acid segment encoding a detectable reporter enzyme under the transcriptional control of a *repB*, *repD* or *APE* promoter region.
- 10 20. The method of claim 19, wherein said detectable reporter enzyme encodes β-galactosidase, β-glucuronidase, luciferase or green fluorescent protein.
- 15 21. The method of claim 1, wherein said assay further comprises a positive control for inhibition of expression of one or more of *repB*, *repD* and *APE* gene products.
22. The method of claim 1, wherein said assay further comprises a positive control for induction of expression of one or more of *repB*, *repD* and *APE* gene products.
23. The method of claim 1, wherein said assay further comprises a positive control for cytotoxicity.
- 20 24. The method of claim 1, wherein said assay further comprises a negative control for inhibition of expression of one or more of *repB*, *repD* and *APE* gene products.
25. The method of claim 1, wherein said assay further comprises a negative control for induction of expression of one or more of *repB*, *repD* and *APE* gene products.
26. The method of claim 1, wherein said assay further comprises a negative control for cytotoxicity.

27. The method of claim 1, wherein said test agent is a naturally-occurring molecule.

28. The method of claim 1, wherein said test agent is a synthetic molecule.

29. The method of claim 1, wherein said test agent is a synthetic derivative of a naturally-occurring molecule.

5 30. The method of claim 1, further comprising assessing DNA damage in said cell.

31. The method of claim 30, wherein assessing DNA damage comprising mass spectroscopy.

32. A vegetative cell of *Dictyostelium discoideum* stably transformed with an expression cassette comprising a nucleic acid segment encoding a detectable reporter enzyme under the transcriptional control of a *repB*, *repD* or *APE* promoter region.

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33. A method of making a compound for use in the prevention or treatment of cancer comprising:

15 (a) contacting a vegetative cell of *Dictyostelium discoideum* with said compound;

(b) assessing the cytotoxicity of said compound;

(c) assessing the effect of said compound on the expression of one or more of *repB*, *repD* and *APE*;

(d) comparing said cytotoxicity and said expression in the presence of said compound with a vegetative cell of *Dictyostelium discoideum* not exposed to said compound; and

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(e) making said compound.